Asbestos and Heavy Metal Paint Survey and Assessment of VAB Siding Repair/Replacement

Location:

Kennedy Space Center, Florida

Prepared for:

Reynolds, Smith & Hills, Inc.
2235 N. Courtenay Parkway, Suite C
Merritt Island, Florida
32953-5227

Prepared by:

Browning Environmental Service Technologies
3954 N. W. 41st Court
Gainesville, Florida 32606-4557

BEST **Project # 501-004**
RS&H Project # 302-3354-020

February 7, 2005

Table of Contents

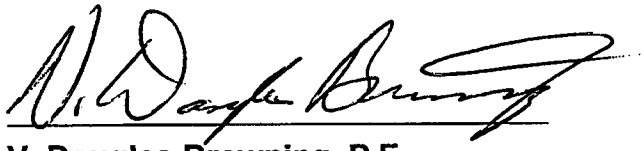
List of Tables

List of Figures

List of Appendices

Environmental Survey Title Sheet

Facility Name:	**Vehicle Assembly Building**
Address:	**Launch Complex 39**
City:	**Kennedy Space Center, Florida**
Owner:	**National Aeronautics and Space Administration (NASA)**
Date of Survey:	**January 27, 2004**
Environmental Consultant:	**Browning Environmental Service Technologies**
Address:	**3954 N. W. 41st Court**
City:	**Gainesville, Florida 32606-4557**
Phone:	**(352) 258-6284**



V. Douglas Browning, P.E.
EA 0000029
PE 0041407

1.0 INTRODUCTION

1.1 Description of Asbestos

Asbestos is the name of a group of natural minerals that separate into strong, very fine fibers. The asbestos fibers being heat-resistant and extremely durable, make asbestos very useful in construction and industry. Although there are several different types of asbestos, nearly 95 percent of all asbestos used in commercial products today is a type called *chrysotile.*

The potential of an asbestos-containing product to release fibers is dependent upon several factors, including its location and degree of friability. Friable means that it can be crumbled with hand pressure and, therefore, is likely to emit fibers when disturbed. The fibrous or fluffy spray-applied asbestos materials used in many buildings as fireproofing, insulation, or for decorative purposes are generally considered friable. Non-friable materials such as vinyl floor tiles are likely to emit fewer airborne fibers unless subjected to sanding or cutting operations.

Between 1900 and 1980, some thirty million tons of asbestos were put in place; however, since the 1970s, asbestos use has declined significantly.

1.1.1 Identifying Asbestos

Asbestos has been used in a variety of forms. It has been sprayed or troweled onto ceilings, beams, walls, and other structural components of buildings. It was used for thermal, acoustical, and decorative purposes, and to insulate boilers and pipes, as well as many other construction materials and appliances.

1.2 Description of Heavy Metal Paint

Lead is considered to be one of the seven metals of antiquity, and its discovery has been traced to the development of the process of metal refining. Archaeologists have found lead pigments on buildings constructed around 3000 B.C. and, after 5000 years, the color is easily identifiable explaining why lead has been used as a paint additive for centuries. For years the standard for

paint was "high lead content equals high quality paint," even after the more harmful effects of lead were known as early as the 19th century. In the past few decades the lead in some paints has been displaced by other heavy metals which are not as toxic to animals thus the use of Chromium and Cadmium is becoming more common. These are still heavy metals but the concentration of them must varies significantly from that of lead to be harmful to animals.

1.2.1 Identifying Heavy Metal Paint

Lead-Based Paint (LBP) and paint containing Lead, Cadmium, and Chromium (heavy metal) compounds has been used for many years as the primary protection for exterior surfaces and other structural components of buildings and equipment. These additives are also used to provide the gloss and color stability to gloss and semi-gloss paints used extensively on the metal structural components, all types of walls and trim of many buildings and equipment. All glossy painted surfaces and exterior self cleaning paint surfaces are suspect if the building was built before 1970 - 1980 when the use of lead and other compounds in paint was gradually starting to be phased out. Paint used during this phase out could have been heavy metal based unless the material was inspected and verified as lead, cadmium, and chromium free since substantial volumes of paint containing these compounds were still available from distribution warehouses, and for military use.

1.3 Health Concerns

Lead and most heavy metals are a cumulative type of poison that, once they enter the body, are stored and retained in the various body systems and gradually expelled through the urine and the gastrointestinal tract. Since the intake of heavy metal for the average person, from birth through the work years) exceeds the amount expelled, the total body heavy metal content will increase in most persons until around the age of 70. At that age the intake of heavy metals significantly decreases and the body eliminates more than it acquires.

1.3.1 Lead, Cadmium, and Chromium Compounds

Pigments based on lead, cadmium, and chromium compounds can present a serious health concern when spray painting or when preparing a surface by sanding or abrasive blasting prior to repainting. Overexposure to lead can create a fragility of the red blood cells causing them to be destroyed more rapidly in the body. This can lead to anemia and other damaging effects on organs

and tissues. Some lead compounds are carcinogens of the lungs and kidneys. Cadmium compounds affect the respiratory tract and kidneys and are suspect human carcinogens. Hexavalent chromium compounds found in some industrial paints are human carcinogens.

EPA Guidelines set the standard for lead-based paint (LBP) as follows:

Lead = 1 milligram per square centimeter or 0.5 percent by weight

EPA does not have specific Guidelines that set the standard for cadmium or chromium; however, if you use the OSHA TWAs for the three elements and compare the others to the lead you can interpolate and make the following assumptions as standards for cadmium and chromium.

Cadmium = .1 milligram per square centimeter or 0.05 percent by weight

Chromium = 20 milligram per square centimeter or 10.0 percent by weight

The OSHA standards for these compounds are as follows:

- **Inorganic Lead and Compounds** (OSHA ID 121 & 125G)
  0.05 mg/m^3 TWA
- **Cadmium and compounds** (OSHA ID 189)
  5 µg/m^3 TWA
- **Chromium and Insoluble Compounds** (OSHA ID 121)
  1 mg/m^3 TWA
- **Chromic Acid & Chromates (as CrO_3)** (OSHA ID 103)
  0.1 mg/m^3 Ceiling

2.0 METHODOLOGY

This report documents the inspection and sampling for the presence of suspected asbestos-containing material (ACM) and heavy metal (HM) compounds in paint which could affect the repair/replacement of the siding on the Vehicle Assembly Building, Kennedy Space Center, Florida. The sampling was conducted by V. Douglas Browning of BEST on January 27, 2004. The inspection included all of the areas scheduled to be affected by the repair/replacement of the siding.

The inspector performed the survey moving in a systematic fashion and sampled each identified homogeneous area. A critical step in this process was the delineation of different suspect homogeneous areas of the various materials and the definition of these homogeneous areas for specific sampling of each type of suspect ACM and paint to ascertain if any asbestos or heavy metals are present in the homogeneous areas identified. The delineation of these homogeneous areas formed the basis upon which subsequent steps of the inspection were completed.

In general, homogeneous areas were defined as "those areas of the facility containing a given type of suspect material or paint that is uniform in color and texture." This approach involved notation of the location of each homogeneous area of suspect material and paint by using a coding system to delineate different colors and textures of suspect materials. The designation of each suspect ACM and HM paint homogeneous area was defined based upon the area containing the same type of material and/or color and texture of paint, (as determined by physical appearance, age, and general condition) it was then considered to be one homogeneous area.

Once homogeneous areas were defined, a sampling strategy was developed for each to provide random samples of either suspect ACM or HM Paint. The suspect ACM and HM Paint chip samples from each homogeneous area were analyzed using the appropriate analytical method for each type of sample by a laboratory that is accredited by NVLAP and or AIHA.

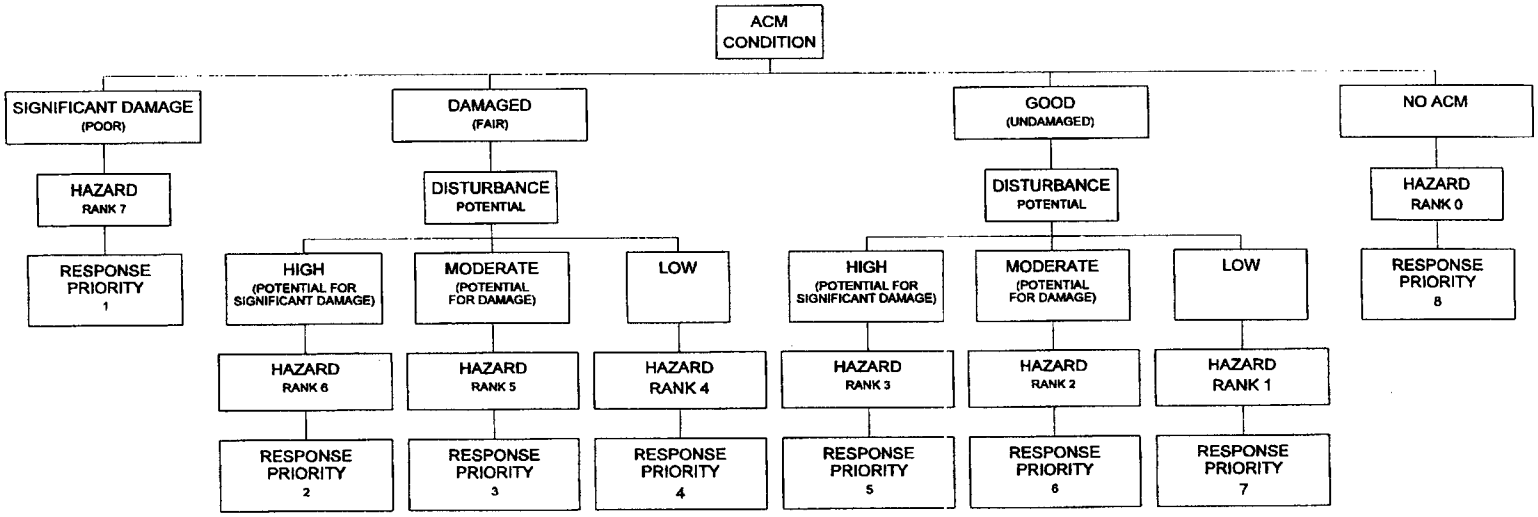
Sample locations using a unique identifying number were noted on the Field Survey Log Sheet and Chain-of-Custody Form. The Field Survey Log Sheet and Chain-of-Custody Forms accompanied the samples to the laboratory, after being signed by the sampler. At the laboratory the analyst receiving the samples then signs for the samples.

During the inspection some of the physical parameters documented by the surveyor for the suspect ACM and LBP were:

- **Condition of material;**
- **Amount of exposed surface area of material;**
- **Activity, movement, or vibrational effects within the area;**
- **Potential for air erosion;**
- **Signs of past disturbance.**
- **Accessibility of material to building occupants;**
- **Friability of material; and**
- **Potential for disturbance.**

Using the above parameters, along with the results of the suspect ACM/ samples, a risk assessment was conducted using the current EPA and HUD guidelines. The current HUD guidelines limit the paint classified as LBP to that which contains 0.5 percent or more lead, by weight (5000 mg/Kg), so during this risk assessment any sample containing lead at or above the HUD limit is considered as LBP, and any samples with more than 0.05 percent chromium, by weight (500 mg/Kg), and 10.0 percent cadmium, by weight (100000 mg/Kg), will be considered to be positive for those specific elements. The larger the percentage the higher the content of the specific element, thus the more probability of a problem with the Heavy Metal Paint (HMP), unless proper precautions are taken.

ASBESTOS HAZARD ASSESSMENT DECISION TREE



THE HIGHER THE HAZARD RANKING THE MORE SEVERE THE PROBLEM, AND BECAUSE PEOPLE TEND TO EQUATE A "1" WITH TOP PRIORITY, THE ASSIGNMENT NUMBERS FOR THE RESPONSE PRIORITY ARE REVERSED TO MAKE "1" THE HIGHEST RANKED.

Figure 2-1

ASBESTOS HAZARD ASSESSMENT TREE

WHY SETTLE FOR LESS, WHEN YOU CAN HAVE THE BEST
BROWNING ENVIRONMENTAL SERVICE TECHNOLOGIES

3.0 DISCUSSION OF FINDINGS AND RECOMMENDATIONS

Table 3-1, shows the location of all suspect ACM samples taken and the associated homogeneous areas. Only the samples containing asbestos at greater than the 1 percent guidelines were considered as ACM. For this reason the findings do not discuss the homogeneous areas that were sampled but found to contain less than the 1 percent threshold which NESHAP considers to be ACM. Table 3-2, shows the location of all suspect HMP samples taken and the associated homogeneous areas. Only the paint chip samples containing HM equal to or more than the preceding guidelines were considered as HMP. For this reason the findings do not discuss the homogeneous areas of paint that were sampled but found to contain less than the guidelines.

3.1 Sampled Suspect ACM

All of the suspect materials observed were sampled so there are not any materials that are presumed to be ACM and not sampled.

3.1.1 Spray/Trowel Applied Surfacing Material

3.1.1.1 Friable

There were no suspect homogeneous areas of friable spray/trowel applied surfacing material identified.

3.1.1.2 Non-Friable

There were no suspect homogeneous areas of non-friable spray/trowel applied surfacing material identified.

3.1.2 Thermal System Insulation (TSI)

3.1.2.1 Friable

There were no suspect homogeneous areas of friable TSI identified.

3.1.2.2 Non-Friable

There were no suspect homogeneous areas of non-friable TSI identified.

3.1.3 Miscellaneous Materials

3.1.3.1 Friable

There were no suspect homogeneous areas of friable miscellaneous materials identified.

3.1.3.2 Non-Friable

There were three different suspect homogeneous areas (HA) of non-friable miscellaneous materials identified. All were HA's of caulking/sealant materials RC-1, RC-1A and C-1 from various locations on the building..All were used to seal louvers and piping thimbles to the siding of the building. Analyses of RC-1 and RC-1A to be non-ACM, while C-1 was found to contain 20 percent chrysotile asbestos in the caulking that seals the ECS thimbles to the siding.

3.2 Sampled Suspect Heavy Metal Paint (HMP)

There was one HA of suspect HMP sampled at two locations in the building, where the siding renovations/repairs will be performed and the material will be subject to drilling.

3.2.1 Gray Flat Paint on Interior Horizontal Steel Beam: GF-1

The sample taken of HA, GF-1, gray flat multi-layered suspect HM Paint chips from the steel horizontal support beams for the siding, was analyzed and confirmed to be heavy metal-based paint containing more than 5.77 percent lead, less than 0.00 percent chromium and 0.00 percent

cadmium. Since only the Cadmium and Chromium are below the threshold values for each element, and the Lead is above the paint shall be considered to be LBP only.

3.2.2 Gray Flat Paint on Interior Horizontal Steel Beam: GF-1

.The sample taken of HA, GF-1, gray flat multi-layered suspect HM Paint chips from the steel horizontal support beams for the siding, was analyzed and confirmed to be heavy metal-based paint containing more than 0.12 percent lead, less than 0.00 percent chromium and 0.00 percent cadmium. Since all the Lead, Cadmium and Chromium are below the threshold values for each element, this sample was negative, however since the other sample is positive for Lead all of this type paint shall be considered to be LBP.

3.3 Recommendations

3.3.1 ACM

The Caulking/Sealant used on the ECS thimbles to seal them to the siding is the only ACM identified. If this material is to be disturbed then it must be abated prior to the material being disturbed. It is non-friable as long as it is pliable and it is less than the amount requiring full containment so it may be removed using a mini-enclosure or a glovebag.

3.3.2 Heavy Metal Paint

There was one HA of suspect HM Paint identified that was confirmed to contain more than the threshold percentage levels for lead and thus GF-1 must be treated as being LBP. If this HA is to be disturbed then it must be either abated or removed and provided with the appropriate disposal before it is disturbed during the roof renovation.

BROWNING ENVIRONMENTAL SERVICE TECHNOLOGIES

ASBESTOS SURVEY AND ASSESSMENT FORM

BEST PROJ. No.: 501-004 Field Group I.D.: B501KSCVABS*
Building Owner: NASA, Kennedy Space Center
Building: Vehicle Assembly Building, Siding
Inspector (s): DOUG BROWNING
Date of Survey: January 27, 2004

Building Contact Person: Darold F. Cole, RS&H (321) 453-0212
Laboratory Performing Analysis: EMSL Analytical, Inc.
Consultant/Lic. Nos.: V. Douglas Browning, PE0041407/EA0000029
BROWNING ENVIRONMENTAL SERVICE TECHNOLOGIES, 3954 NW 41st, COURT, GAINESVILLE, FL 32606-4557
BEST Phone: (352)372-4067 FAX No. (352) 335-4304

BUILDING ROOM ID/NO.	SAMPLE NO.	(TYPE) MATERIAL	HOMOGENOUS AREA OR FUNCTIONAL SPACE	UNITS & Approx.. QUANTITY	(Y-N) FRIABLE	PERCENT & TYPE ASBESTOS	G - GOOD F - FAIR, P - POOR CONDITION	(H, M, L) DAMAGE POTENTIAL	HAZARD ASSESSMENT	RESPONSE PRIORITY	AMBIENT AIR MONITORING REQ. (Y-RESULT)	APPROXIMATE RESPONSE COST: RESPONSE	AIR MONITORING	REPLACE MENT	ADDITIONAL COMMENTS
Roof, Elev 210	1	Misc.	RC-1	5	N	None	G	L							Int and Ext Corners of Mech Room
Roof, Elev 210	2	Misc.	RC-2		N	None	G	L							Vent Louvers of Mech Room, SE Cor
Ground	3	Misc.	C-1	10	N	None	G	L							ECH Thimbles at Siding
Ground	4	Misc.	C-1		N	20% Chry	G	L	1	7	N/A	$250	$100	$60	ECH Thimbles at Siding
Ground	5	Misc.	C-1		N	20% Chry	G	L	1	7	N/A				ECH Thimbles at Siding

COMMENTS/NOTES:

SUBTOTALS (this page)	$250	$100	$60
Run Total for REMOVAL/REPLACE	$250		$60
Run Total for CONSULTANT FEES		$100	

TABLE 3 - 1

BROWNING ENVIRONMENTAL SERVICE TECHNOLOGIES

HEAVY METAL PAINT CHIP SURVEY AND ASSESSMENT FORM

BEST PROJ. No.: *501-004* ***Field Group I.D.:*** *M501KSCVABS**

Inspector (s): *DOUG BROWNING*

Building: Vehicle Assembly Building

Laboratory: **EMSL, ANALYTICAL, INC**

Lab Contact Person: Ray Wilkins, (800) 220-3675 X 1263

Building Owner: *NATIONAL AERONAUTICS and SPACE ADMINISTRA*

Building Contact Person: *Darold Cole, RS&H (321) 453-0223*

Consultant: V. Douglas Browning

BROWNING ENVIRONMENTAL SERVICE TECHNOLOGIES, 1709 NE 40th, PLACE, GAINESVILLE, FL 32609

BEST PHONE: (352)372-4067 FAX No. (352) 335-4304

SAMPLE NO.	SAMPLING DATE	LOCATION OF SAMPLE (INTERIOR, EXTERIOR, SURFACE) AND SUBSTRATE MATERIAL	SPECIFIC HOMOGENEOUS AREAS	PEELING BUBBLES (Y-N)	G - GOOD F - FAIR, P - POOR CONDITION	(H, M, L) DAMAGE POTENTIAL	AREA OF SAMPLE (SQUARE CM)	LEAD RESULTS PERCENT	LEAD RESULTS mg/Kg	CADMIUM RESULTS PERCENT	CADMIUM RESULTS mg/Kg	CHROMIUM RESULTS PERCENT	CHROMIUM RESULTS mg/Kg	
* ***1***	***01/27/04***	***Int. Horizontal Steel Support***	***GF-1***	***N***	***G***	***L***	***2.0***	***5.78%***	***57760.00***	0.02%	226.00	0.00%	27.20	***Gray, MLF***
* 2	01/27/04	Int. Horizontal Steel Support	GF-1	N	G	L	2.0	0.12%	1230.00	0.02%	208.00	0.00%	27.60	Gray, MLF
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														
*														

Appendix A

Personnel Certifications

Appendix B

Laboratory Analysis Data Sheets

EMSL Analytical, Inc.
5125 Adanson Street, Suite 900, Orlando, FL 32804
Phone: (407) 599-5887 Fax: (407) 599-9063 Email: orlandolab@emsl.com

Attn: **Doug Browning**
Browning Environmental Serv. Tech.
3954 NW 41ST Court
Gainesville, FL 32606-4557

Fax: (352) 335-4304 Phone: (352) 665-1374
Project: **501-004 Vehicle Assembly Bldg., Siding**

Customer ID: BROW65
Customer PO: ck #884 $160
Received: 01/28/05 3:17 PM
EMSL Order: 340500311

EMSL Proj:
Analysis Date: 2/4/2005
Report Date: 2/4/2005

Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	Location	Appearance	%	Fibrous	%	Non-Fibrous	% Type
1 *340500311-0001*	ext int. & ext. corners rubber caulk	Gray Non-Fibrous Heterogeneous			100%	Non-fibrous (other)	None Detected
2 *340500311-0002*	ext. vent louvers SE corner roof #3	White Non-Fibrous Heterogeneous			100%	Non-fibrous (other)	None Detected
3 *340500311-0003*	ext. ECS pipe HB-2 grey calk	Brown/Gray Non-Fibrous Heterogeneous			80% 20%	Quartz Non-fibrous (other)	None Detected
4 *340500311-0004*	ext. ECS pipe HB-2 grey calk	Brown/Gray Non-Fibrous Heterogeneous	5%	Glass	75%	Non-fibrous (other)	20% Chrysotile
5 *340500311-0005*	ext. ECS pipe HB-2 grey calk	Brown/Gray Non-Fibrous Heterogeneous	5%	Glass	75%	Non-fibrous (other)	20% Chrysotile

Analyst(s)
Randy Pruitt (5)

Blanca Cortes, Ph.D.
or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. Samples reported as <1% or none detected may require additional testing by TEM to confirm asbestos quantities. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of EMSL Analytical, Inc. EMSL's liability is limited to the cost of analysis. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client.
Analysis performed by EMSL Orlando (NVLAP #101151-0, Texas Cert. #30-0291)

EMSL Analytical
3 Cooper St., Westmont, NJ 08108
Phone: (856) 858-4800 Fax: (856) 858-4571 Email: swesson@emsl.com

Attn: **Doug Browning**
Browning Environmental Serv. Tech.
3954 NW 41ST Court
Gainesville, FL 32606-4557
Fax: (352) 335-4304 Phone: (352) 665-1374

Customer ID: BROW65
Customer PO:
Received: 01/31/05 11:23 AM
EMSL Order: 010500330
EMSL Proj: 501-004
Report Date: 2/2/05

Client Sample Description 1
East Lower Bay Mech Room, East Wall,
Gray Flat Pal

Lab ID: 0001

Test	Method	Parameter	Concentration	Units	Analysis Date/Time	Notes
Cadmium, Total	6010B	Cadmium	226.0	mg/Kg	2/1/05 07:49 PM	
Chromium, Total	6010B	Chromium	27.2	mg/Kg	1/31/05 10:41 PM	
Lead, Total	6010B	Lead	57760	mg/Kg	2/1/05 07:49 PM	

EMSL Analytical
3 Cooper St., Westmont, NJ 08108
Phone: (856) 858-4800 Fax: (856) 858-4571 Email: gwesson@emsl.com

Attn: **Doug Browning**
Browning Environmental Serv. Tech.
3954 NW 41ST Court
Gainesville, FL 32606-4557
Fax: (352) 335-4304 Phone: (352) 665-1374

Customer ID: BROW65
Customer PO:
Received: 01/31/05 11:23 AM
EMSL Order: 010500330
EMSL Proj: 501-004
Report Date: 2/2/05

Client Sample Description 2
east Lower Bay Mech Room, South Wall, Gray Flat Pa

Lab ID: 0002

Test	*Method*	*Parameter*	*Concentration*	*Units*	*Analysis Date/Time*	*Notes*
Cadmium, Total	6010B	Cadmium	208.0	mg/Kg	2/1/05 07:56 PM	
Chromium, Total	6010B	Chromium	27.5	mg/Kg	1/31/05 10:41 PM	
Lead, Total	6010B	Lead	1230	mg/Kg	1/31/05 10:41 PM	